IN THE CLAIMS:

1. (ORIGINAL) A system configured to allow an intermediate node to be gracefully re-
moved from service in a network, the system comprising:

    a processing element of the intermediate node;

    an operating system executed by the processing element to functionally organize
the intermediate node and invoke operations in support of a routing protocol executing on
the node; and

    a Graceful Shutdown Notification message created by the processing element and
sent to routing protocol peers to announce an intention of the intermediate node to be
gracefully removed from service, the Graceful Shutdown Notification message further
indicating that the intermediate node is able to continue forwarding packets over the net-
work for a grace period, thereby allowing backup paths to be propagated to each peer and
put into service prior to a final withdrawal of routes advertised by the intermediate node.

2. (ORIGINAL) The system of Claim 1 wherein the Graceful Shutdown Notification
message comprises a Cease error code with one of an Administrative Graceful Shutdown
and Administrative Graceful Reset subcode.

3. (ORIGINAL) The system of Claim 2 wherein the Graceful Shutdown Notification
message further comprises a retention time value representing the grace period during
which the intermediate node maintains a forwarding state after sending the Graceful
Shutdown Notification message.

4. (CURRENTLY AMENDED) The system of Claim 4 1 wherein the routing protocol is
a Border Gateway Protocol (BGP).

5. (CURRENTLY AMENDED) The system of Claim 5 4 wherein the intermediate node
is a BGP router.

6. (ORIGINAL) A method for allowing a router to be gracefully removed from service in
a network, the method comprising the steps of:

    modifying a routing protocol executing on the router to enable the router to an-
nounce to its peers in the network its intention to be gracefully removed from service;
and

    forwarding packets from the router over the network for a grace period, thereby
allowing backup paths to be propagated to each peer and put into service prior to a final
withdrawal of routes advertised by the router.

7. (ORIGINAL) The method of Claim 6 wherein the routing protocol is the Border
Gateway Protocol (BGP) and wherein the step of modifying comprises the step of insert-
ing one of an Administrative Graceful Router Shutdown and Administrative Graceful
Router Reset subcode into a BGP Graceful Shutdown Notification message with error
code Cease.

8. (ORIGINAL) The method of Claim 7 further comprising the step of setting a forward-
ing information base (FIB) retention time value in a data field of the message, the FIB
retention time value representing the grace period during which the router maintains its
forwarding state after sending the Graceful Shutdown Notification message.

9. (ORIGINAL) The method of Claim 8 further comprising the steps of:

    sending the Graceful Shutdown Notification message from the router to its peers;
and

4   terminating all connections between the router and the peers, thereby implicitly

5   withdrawing from service, at the router, all original routes advertised on the terminated

6   connections.

1   10. (ORIGINAL) The method of Claim 9 further comprising the steps of:

2   receiving the Graceful Shutdown Notification message at the peers; and

3   retaining the withdrawn routes advertised on the terminated connections at the

4   peers until one of selection of another route as a best path and elapse of the grace period.

1   11. (ORIGINAL) The method of Claim 10 further comprising the step of, in response to

2   one of selection of the best path and elapse of the grace period, removing the retained

3   routes from service.

1   12. (ORIGINAL) The method of Claim 11 wherein the step of removing comprises the

2   step of removing the retained routes from a FIB of each peer.

1   13. (ORIGINAL) The method of Claim 11 further comprising the steps of, if a peer holds

2   a backup route for any of the withdrawn routes:

3   selecting the backup route as the best path; and

4   advertising the selected best path over the network.

1   14. (ORIGINAL) The method of Claim 10 further comprising the steps of:

2   marking the original routes as last resort routes; and

3   triggering the network to announce backup routes and re-converge without fully

4   withdrawing the original routes.

1   15. (ORIGINAL) Apparatus adapted to allow a router to be gracefully removed from ser-

2   vice in a network, the apparatus comprising:

4

3   means for modifying a routing protocol executing on the router to enable the

4   router to announce to its peers in the network its intention to be gracefully removed from

5   service; and

6   means for forwarding packets from the router over the network for a grace period,

7   thereby allowing backup paths to be propagated to each peer and put into service prior to

8   a final withdrawal of routes advertised by the router.

1   16. (ORIGINAL) The apparatus of Claim 15 wherein the routing protocol is the Border

2   Gateway Protocol (BGP) and wherein the means for modifying comprises means for in-

3   serting one of an Administrative Graceful Router Shutdown and Administrative Graceful

4   Router Reset subcode into a BGP Graceful Shutdown Notification message with error

5   code Cease.

1   17. (ORIGINAL) The apparatus of Claim 16 further comprising means for setting a for-

2   warding information base (FIB) retention time value in a data field of the message, the

3   FIB retention time value representing the grace period during which the router maintains

4   its forwarding state after sending the Graceful Shutdown Notification message.

1   18. (CURRENTLY AMENDED) A computer readable medium containing executable

2   program instructions for execution on a router for allowing a the router to be gracefully

3   removed from service in a network, the executable program instructions comprising pro-

4   gram instructions for:

5   modifying a routing protocol executing on the router to enable the router to an-

6   nounce to its peers in the network its intention to be gracefully removed from service;

7   and

8   forwarding packets from the router over the network for a grace period, thereby

9   allowing backup paths to be propagated to each peer and put into service prior to a final

10   withdrawal of routes advertised by the router.

19. (ORIGINAL) The computer readable medium of Claim 18 wherein the routing proto-
col is the Border Gateway Protocol (BGP) and wherein the program instruction for modi-
fying comprises one or more program instructions for inserting one of an Administrative
Graceful Router Shutdown and Administrative Graceful Router Reset subcode into a
BGP Graceful Shutdown Notification message with error code Cease.

20. (ORIGINAL) The computer readable medium of Claim 19 further comprising one or
more program instructions for setting a forwarding information base (FIB) retention time
value in a data field of the message, the FIB retention time value representing the grace
period during which the router maintains its forwarding state after sending the Graceful
Shutdown Notification message.